MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

BRITISH ORGANIC REMAINS.

DECADE V.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE:
PUBLISHED BY
LONGMAN, BROWN, GREEN, AND LONGMANS.
1856.

BRITISH FOSSILS.

DECADE THE FIFTH.

In apologizing for the unavoidable delay which has taken place in the publication of this Decade, owing to the much lamented decease of Professor Edward Forbes, it is right to state that the materials left behind by him were scanty, and had been unfortunately mislaid a short time before his death. The first description only, that of *Solaster Moretonis*, had been fully written by him; of the others, we had here and there notes on the distinctive characters of the species, and of his views as to their synonymy or history. The plates, however, had been all engraved under his own eye, and the specific designations under which he wished the figures to stand, were recorded in the last edition of Morris's Catalogue. He had there also applied MS. names to a number of species to be described in the Decade.

In a few cases only it has been found necessary to alter some of these names; and this has been done in deference to an authority which would have been gladly admitted by Professor Forbes. To Mr. S. P. Woodward, of the British Museum, we are indebted for all the notes respecting these supplementary species; and he has also furnished full descriptions of three of the plates. With this valuable aid, and the friendly communications of Dr. T. Wright, of Cheltenham, we can present the Decade in nearly as complete a form as it would have possessed had our friend and Master lived to finish it. We miss, however, his lively remembrance of the living species, and his practical acquaintance with their variations,—deficiencies not to be supplied by reference to his published works.

Of the ten species figured three are new,—*Solaster Morcionis*, *Cidaris Carteri*, and *Pygaster conoideus*. Of the other genera, *Diadema*, *Echinopsis*, and *Echinus* present us with well-known types from the Oolitic rocks, which are continental as well as British. *Pyrina* is a rare genus in England, and in this, and the two figured species of *Pygaster*, we have excellent examples of that division of the *Cassidulidæ* in which the ambulacra are of uniform character throughout. Several genera of this type have been figured in the Decades. The *Pygaster semisulcatus* is a critical species, and its synonymy is now for the first time cleared up. *Hemiaster Murchisoniæ* is another instance of the same kind, and belongs to a large genus of closely allied species. The *Brissus Scillæ* is a Crag species still existing in the Mediterranean. None of these nine genera have before appeared in the Decades.

There are engraved plates sufficient for another fasciculus, upon which Professor Forbes left no memoranda, except the names of the species. These Plates will be published at a future period.

JOHN W. SALTER,
Palæontologist.

Geological Survey Office, Jermyn Street, London,
February 1856.

BRITISH FOSSILS.

Decade V. Plate I.

SOLASTER MORETONIS.

[Genus SOLASTER. Forbes, 1839. (Sub-kingdom Radiata. Class Echinodermata. Order Asteriadæ. Family Solasteridæ.) Body stellate, multiradiate, covered with fasciculated spines; avenues bordered by three sets of spines; suckers biserial. (Crossaster, Müller.]

Diagnosis. *S. radiis numerosis* (30), *angustis, linearibus.*

Reference. *Solaster Moretonis*, Forbes (1854), in Morris's Catal.; 2nd edit. p. 89.

Very few species of the genus *Solaster* are known in the seas of the passing epoch. *Solaster papposus* and *S. endeca* are both inhabitants of the European seas. They are many rayed star-fishes of considerable dimensions, and resemble in their shape the conventional figure of the sun. None had hitherto been found in the fossil state until the remarkable and unique star-fish now for the first time figured and described was procured by Earl Ducie. It was found in a fawn-coloured freestone belonging to the Great Oolite (?) at Windrush Quarry, in Gloucestershire.

It differs conspicuously from its living congeners in the great number of its rays and their linear contour. The details of its structure are such as leave little doubt respecting its generic position, and I do not feel warranted in constituting a new genus for its reception. If, however, the discovery of other specimens should show that the dorsal surface is furnished with simple and not paxillated spines, then the foundation of a new genus might be necessary.

At first glance this beautiful and well-preserved fossil seems as if it were the head of a Crinoid, with outspread arms, crushed flat. A nearer inspection shows that it is really a star-fish, and suggests a close comparison between it and *Uraster helianthus*, a well-known many-rayed species from the Pacific coasts of South America. A still closer examination proves that it is not a member

of the family of *Urasteriadæ*, a group distinguished by the presence of four rows of suckers in each ambulacral avenue, but belongs to one of the genera in which there are but two rows of ambulacral feet. The peculiar arrangement of the ossicles of the disk, which are perfectly preserved in the specimen, the forms of the ambulacral ossicula, the single series of interambulacral bones, the arrangement and shape of the spines on the border of the avenues, and of the ossicula at the basal angles of the arms, all indicate its probable position in the genus *Solaster*.

The diameter of the individual figured, measured from ray point to ray point, is somewhat more than 5 inches, the disk is 1 inch and $\frac{5}{12}$ across, and a ray is 2 inches long, and $\frac{4}{12}$ of an inch broad at its widest part. The average breadth of an ambulacrum is $\frac{2}{12}$ of an inch. There are thirty-three rays, in all of which the ambulacral portions as well as the borders are beautifully preserved. The extremities of some of the rays are partially turned over, but the portion of the dorsal surface thus exposed is obscured by crushed spines. The inner surface of the dorsal integument of the disk occupies the centre, all the ventral portions of that region having disappeared. The framework of the dorsal disk is for the most part excellently preserved. The skeleton in this region is composed of a number of rather stout and vertically compressed oblong ossicles overlapping each other slightly, arranged in a loose and somewhat irregularly reticular pattern. The connecting ossicula are most perfectly seen, the spiniferous ones being partially concealed by their supporters. Towards one side of the disk is a rounded impressed space with traces of a wrinkled surface. This I take to be the position and remains of the madreporiform tubercle.

The position of the vent cannot be clearly traced; a circumstance by no means surprising, considering the difficulty there is in observing the place of this orifice in the living star-fishes.

The arms are very narrow, and of a linear shape; their sides being parallel throughout the greater portion of their length. At the point of junction of the base of each arm with that of the next, is a pair of erect semi-circular, compressed, slightly sinuous, sharp-edged bones (the angle-ossicula). Their inner edges, *i. e.* those directed towards the mouth, approximate; their outer edges are divergent. Their upper edges spread outwards, but much less so than in the corresponding bones in the recent *Solaster papposus*, and they are much more compressed and elevated. Along their outer margin are rows of slender spines.

Each avenue is composed of two series of ambulacral ossicles, about sixty in a row, their inner edges being minutely crenulated and accurately meeting along the centro-sutural line. These ossicles are shaped something like a dice box,* each divided into two more expanded portions and a central narrower part. The inner portion is flattened or slightly excavated, and somewhat rhomboidal, the outer elevated into a ridge. The middle and more contracted portion is carinated obliquely, and on the inner (proximal) side has a triangular groove. A similar groove occurs on the outer (distal) side, placed nearer the middle than the former. The sides of the ossicles are widely excavated for the purpose of forming the ambulacral perforation through which the soft suckers or ambulacral feet passed. The interambulacral ossicles are rather quadrate, and divided diagonally, though somewhat irregularly and lobe-like, into two portions, of which the inner or inferior portion is elevated, and the outer depressed. These ossicles change shape, and become narrower as they approach the buccal regions of the ventral disk. Their crests or elevated portions bear combs of long slender acicular spines, with bulbous bases; of these spines there are from four to six in each transverse row. The arrangement of the dorsal surface of the arms is too obscure in the few portions of those organs that are reversed to enable me to make out their details with certainty; but I think I can perceive pretty clearly the paxillated character of the spines, and that these bodies, forming the radiated or brush-like crowns of the paxillæ above described, are much shorter and stouter than the marginal spines.

Locality and Geological Position.—In the Oolite of Windrush Quarry, near Northleach, Gloucestershire. (Collection of Earl Ducie.)

* They are much less bent, even near the mouth, than in the recent *S. papposus*.—J.W.S.

Description of the Plate.

Fig. 1. *Solaster Moretonis*, natural size.
Fig. 2. Magnified ambulacral ossicles.
Fig. 3. The same, with some interambulacral ossicles magnified,—the comb-like spines attached.
Fig. 4. Inner (proximal) portion of the ambulacrum, with its large angle-ossicula, and their spines.
Fig. 5. Reticular pattern of the ossicles of the disk.

E. Forbes (1854).

March 1856.

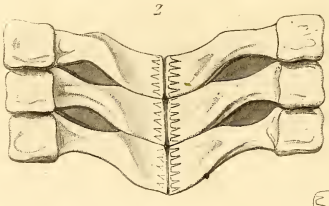
Geological Survey of the United Kingdom.

SOLASTER
(Oolitic)

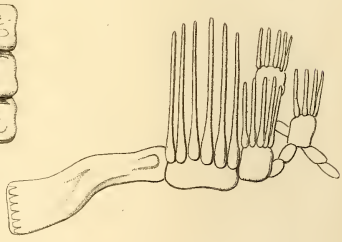
1

4

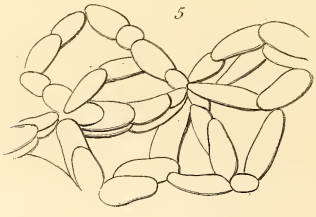
2



3



5



SOLASTER MORETONIS — *Forbes.*